PATH Workshop 5 Report

Annotated Task List

November 19, 1997

This report summarizes the main points of discussion at the PATH workshop at The Resort at the Mountains, October 20-23, 1997. The objectives of the workshop were to:

1. Make substantial progress on completing the preliminary decision analysis for Snake River spring-summer chinook.

2. Plan work for next six months: spring/summer chinook, fall chinook, steelhead

Progress and discussion on various components of the preliminary decision analysis (Objective 1) will be reported in the form of a preliminary decision analysis report, a large portion of which was completed at the workshop. A draft of this report for internal review will be distributed soon. The workplan for the next 6 months (Objective 2) is being compiled by ESSA using Microsoft Project software; a Gantt Chart showing the workplan will be faxed to you. The purpose of this brief workshop report is to summarize key issues and points of discussion for tasks that were specifically discussed at the workshop. Note that the Planning Group haven't yet assigned people to all of these tasks; that's the next step, and there will be another iteration on this tasklist once that has been done.

1. Spring/Summer Chinook

1.1 Retrospective Analysis

1.1.6 Habitat

A few retrospective habitat tasks are remaining from last year's workplan. Prospective analyses of the implications of future habitat management have already been completed using an expert judgement approach, and these retrospective habitat tasks for spring/summer chinook are intended to supplement, not replace, the expert judgement approach already completed.

Sub-Group D felt the remaining retrospective tasks were worth pursuing, since either a) they were not anticipated to involve a lot of additional time or work to complete (e.g. 1.1.6.3 - PIT-tag overwintering analyses - convert detection probabilities into survival rates), or b) the people assigned to work on them were not scheduled to work on anything else (e.g. 1.1.6.1 - Compare EA data vs. Ricker *a* values).

Retrospective habitat tasks will be completed by the end of December.

1.1.7 Hatchery

There are two broad classes of hatchery hypotheses:

1. Do hatchery releases affect survival/productivity of wild fish?

a) sub-basin effects (i.e. sub-basin releases as covariates in $\forall$, $*$ models)
b) regional effects (mu, alpha vs. regional releases)
c) whole-system effects

2. Does supplemental stocking increase returns of adults contributing to subsequent generations?

Preliminary / pilot analyses by Paul Wilson and Charlie Paulsen have been completed. Based on these preliminary results, and the problems encountered while going through these analyses, the workgroup suggested the following refinements for future work. This work should be completed by the end of December if Hatchery hypotheses are to be incorporated into the next phase of the spring/summer chinook decision analysis.

1.1.7.2   Tests for Sub-basin Effects

X   PIT-tag data - do recovery rates vary as f(releases of hatchery fish)?

X   include hatchery fraction (fraction of spawners with hatchery origin) instead of releases in $\forall$, $*$ models

1.1.7.3   Tests for Regional Effects

X   look at detrended relationship between mu, alpha, and regional releases (include steelhead releases; need to check size/age at release)

1.1.7.4   Tests for Whole System Effects

X   review Programmatic Draft Environmental Impact Statement "Impacts of Artificial Salmon and Steelhead Production Strategies in the Columbia River Basin" prepared by CBFWA for FWS, NMFS, BPA; look for prospective hypotheses

1.1.7.5   Decide How to Implement in Prospective Model

X   formal inclusion in stock-recruitment models vs. using quantitative analyses in Tasks 1.1.7.1 - 1.1.7.4 as basis for making subjective assessments

1.2 Prospective Analysis

1.2.1 Hypothesis Formulation

1.2.1.2   Habitat

1.2.1.2.4   Estimate Changes of Ricker *a*'s Resulting from Proposed Habitat Management Actions

X   completed; being circulated for external review

<u>1.2.1.2.5   Revise Estimates in 1.2.1.2.4 Based on External Comments</u>

X   Danny Lee circulating within US Forest Service

X   Bob Reis circulating withing NMFS- Boise

X   Olaf Langness circulating within Washington Department of Fish and Wildlife; preliminary comments:

>   need more explanation of Probability (Change within 12, 24 years)

>   also important to look at changes in habitat quantity (Ricker *b* value) for stocks

<u>1.2.1.2.6   Assess Representativeness of Index Stocks with Respect to All Stocks</u>

X   these analyses are not critical for PATH analyses, so no fixed deadline was assigned. If completed on time, they could go into the final PATH decision analysis report (October 1998).

X   Possible analyses:

>   compare road densities (land-use variable associated with productivity) in index streams to overall road densities

>   compare index escapement to overall escapement

1.2.3 Passage Modeling

1.2.3.8   Diagnostic Runs

There are a number of diagnostics which need to be generated for the Retrospective Base Case, Scenario A1, and Scenario A3 to clarify the behavior of the passage models. These diagnostics are described in Appendix A to this memo, developed by a subgroup at the workshop who were focusing on Section 5.2 of the report (i.e, passage modeling results). These diagnostics should be completed by November 5th, for processing by November 7th by Chris Toole, and discussion at a meeting on November 10th. Undoubtedly, there will need to be several iterations in generating this kind of output as errors are discovered.

In addition to the retrospective and prospective diagnostics defined in Appendix A, it was agreed that the CRiSP and FLUSH modelers would swap T:C data (CRiSP - the T:C data used to get D-values of 0.5 and 0.85; FLUSH - all the T:Cs generated with T:C model). The two groups will calculate retrospective D's (1975-1990) with each T:C data set, and compare results.

Detailed Explanation

The ratio of post-Bonneville survivals of transported (8_t) and non transported (8_n) fish is represented by

$$D = (8_t / 8_n).$$

In FLUSH, retrospective values for *D* are computed for brood year *y* by:

$$D_y = (T/C)_{est} * V_{n,y} / V_{t,y} \qquad [1]$$

where: V_n and V_t are the in-river survivals of non-transported and transported fish respectively; $(T/C)_{est}$ is the T:C ratio estimated from a function in which $(T/C)_{est}$ is inversely related to V_n, and always >1.

FLUSH then computes prospective values for (T/C) by:

$$[2]$$
$$(T/C)_{future} = D_y * V_t / V_n$$

where *y* is the historical year from 1975-1990 that best matches the future year in terms of unregulated water transit times.

In CRiSP, retrospective *D* values were computed from the measured (T/C) for each year with a transportation study:

$$[3]$$
$$D_y = (T/C)_y * V_{n,y} / V_{t,y}$$

The D_y values were then averaged for different time periods (ave. D = 0.5 for years before 1980, and 0.85 after 1980). The CRiSP team is also considering fitting a regression line through D_y to reflect gradual improvements in D_y since 1975. Not that Equation [3] is like Equation [1] except that measured (T/C) value are used instead of estimated ones. For prospective runs, CRiSP uses:

$$[4]$$
$$(T/C)_{future} = D_{random} * V_t / V_n$$

where D_{random} is a randomly selected D_y value from the set of retrospective estimates after 1980.

It can be seen from Equations [2] and [4] that (T/C) is inversely related to V_n in both models, and again in the $(T/C)_{est}$ used in FLUSH (Equation [1]). Differences in future (T/C) values are related to:

1. differences in retrospective values for V_n;

2. differences in the set of years used to estimate future *D*'s (i.e. either 1975-1990 (FLUSH), or just the post-1980 years with transportation studies (CRiSP); and

3. differences in the smoothing procedure used (i.e. smoothing (T/C) estimates (FLUSH) or smoothing (averaging or regressing) the *D* estimates (CRiSP).

The diagnostics in Appendix A will hopefully elucidate the source of differences in V_n (#1); the switching of T:C data should clarify the effects of difference #2 and #3.

1.2.6 Preliminary Decision Analysis Report

These are the following subtasks which need to be completed over the next two months:

   X   November 7th: 2nd draft of Decision Analysis Report sent out to all participants.

   X   November 10th: modelers' meeting in Portland to focus on review of model output (expected location: CRITFC). Out of this meeting, the group will determine what is to be

included in Section 5.2 and what is to be included in Appendix B.2 of the Preliminary Decision Analysis Report.

X   November 10th - 14th: participants review everything but Section 5 and Appendix B which will be written that week.

X   November 17th - 21st: review Section 5 results and Appendix B.

X   November 24th - December 5th: revise Decision Analysis document and send to SRP for review.

X   December 8th - December 19th: SRP provide review comments on the Preliminary Decision Analysis report.

1.2.7 Improve Decision Analysis Report

1.2.7.1   Sensitivity Analysis

The post-processing of model runs to determine the sensitivity of performance measures, and ultimately the selected decision, will be completed during December in parallel with the SRP review. Some of the sensitivity analyses (e.g., sensitivity to habitat and harvest scenarios) will have already been included in the draft report. Other sensitivity analyses pertain to the change in performance measures with the probabilities of alternative hypotheses. This sensitivity analysis is extremely important, for it helps to frame discussions of biological rationale and experimental management.

1.2.7.2   Clarify Hypotheses

We need to clarify both the hypotheses included in the current set of runs, as well as new hypotheses pertaining to the response of fish to an in-river management scenario (A6) and the two John Day drawdown scenarios (natural river (B1) and spillway crest (C1)). There may also be revisions to the original set of hypotheses based both on the review of biological rationale in the draft report, and the comments of the SRP.

1.2.7.3   Complete Second Set of Passage Model Runs

The complete set of runs for the February Decision Analysis Report (February /98) would include seven scenarios: A1, A2, A2N, A3, A6, B1, C1.

1.2.7.4   Experimental Management Workshop

The results of the preliminary analyses will point to some uncertainties that have a major effect on performance measures. We proposed to invite Carl Walters to a workshop in January with representatives of the prospective modeling, hydro, and hydroreg groups to discuss his ideas regarding hydropower system experimental management options that would help to resolve some of these uncertainties. The models could be used as tools in this workshop to explore the ability to detect which of several alternative hypotheses are operating based on simulated future information. Further work is required on exactly how to structure this workshop, and how to use the existing models to simulate future data collected under different states of nature. The workshop will require other model runs to be generated, and should lead to another section of the Final Decision Analysis Report which describes the benefits and risks of experimental management options, particularly as related to the hydrosystem. Workshop participants stressed that there isn't much

time for generating new management options as there are socioeconomic as well as biological analyses associated with each one.

1.2.8 Incorporate Probabilities into Decision Analysis

As basic states of nature are unknown, it is unlikely that the group will be able to converge to specific probabilities for alternative hypotheses. However, based on the biological rationale incorporated into the Preliminary Decision Analysis Report, and the sensitivity analyses described under Task 1.2.7, it may be possible for the group to agree on the range of probabilities of alternative hypotheses which are most likely. The Experimental Management Workshop may suggest means by which the uncertainties associated with the outcomes of alternative management actions could, in time, be reduced (i.e. probabilities of alternative hypotheses are more precisely defined). This will lead to less uncertainty in the ranking of alternative management actions as the experimental results show what the outcome of those actions are likely to be.

Task 1.2.8 would begin at the start of January, 1998 and be completed by mid-February.

1.2.9 Draft Final Decision Analysis Report

This report would be completed during the month of February and would incorporate the results of Tasks 1.2.7 and 1.2.8. The Decision Analysis Report for spring/summer chinook would later be integrated with the results for fall chinook and steelhead.

2. Fall Chinook

There are a number of issues which make the analysis of fall chinook more problematic than that of spring/summer chinook:

X   there are few reach survival studies;

X   there are no transport studies of comparable quality to those of spring/summer chinook;

X   supplementation has occurred historically both inadvertently and intentionally;

X   ocean harvest is of much greater importance than it is for spring/summer chinook;

X   there are a number of uncertainties associated with the drawdown of John Day reservoir including:
  >   potential increased harvest of Lower Snake River stocks,
  >   more spawning and rearing area for fall chinook which could increase the carrying capacity of these stocks (decrease in Ricker *b*), and
  >   less time in reservoirs leading to improved survival through less predation, but also potentially less growth and a longer time to reach minimum size;

X   the effects of high temperatures on adult upstream migration are more important for fall chinook than for spring/summer chinook (temperatures being considered in the Army Corps modeling efforts and at a workshop on temperatures to be held the week of November 3);

X   "Return to the River" issues are more important for fall chinook than for spring/summer chinook; and

X   future options for supplementation need to be considered explicitly in the fall chinook modeling.

2.1 Retrospective Analyses

2.1.1 Complete Run Reconstructions for Index Stocks

There are four index stocks of ocean-type chinook (Table 2-1).

Table 2-1: Index stocks of ocean-type chinook.

Stock	Freshwater Recruitment	Marine Harvest Rates
Lewis River*	1964-present	1980-present
Deschutes River	1975-present	?
Hanford*	1964-present	1975-present
Snake River	1970-present	1985-present

* These stocks have both hatchery and wild stocks marked, which allow calculation of SARs.

The run reconstructions and marine harvest rate estimations are to be completed by mid-December. The people involved include:

1. freshwater run reconstructions (**Howard Schaller**, Ray Beamesderfer, Olaf Langness, Erik Tinus, Jim Scott [NMFS])
2. ocean harvest group (**Howard Schaller**, Mary Ann McClure, Dell Simons, Phaedra Budy, Jim Norris)

Olaf Langness may be able to include the Wenatchee summer chinook in the list of ocean-type stocks that are included in the run reconstructions.

2.1.2 SAR Comparison Between Hanford and Lewis River Stocks

By adjusting the Hanford SARs for dam mortality, one could estimate what the residual effects are of both reservoir mortality and post-Bonneville mortality on Hanford salmon. This analysis could be done quite quickly. It is worthwhile to examine the work completed by Clarabelle Hernandez, as a part of the analysis of SARs (Mary Ann McClure will take a look at this).

The thesis by Saang-Yoon-Hyun (MSc. thesis) compares Hanford and Snake River stocks. John Williams commented at the workshop that straying from the Hanford Reach, though only 800-900 fish, could currently make a significant contribution to the Snake River fall chinook, as the abundance of the latter is approximately equal to the number of strays.

2.1.3 Calculation of Snake River SARs

John Williams and Gene Williams (coordinating with Peter Dygert and Jim Scott on run reconstruction info) offered to do a "back-of-the-envelope" calculation of SARs for Snake River fall chinook.

2.1.4 Review Previous Modeling Work on Fall Chinook and Identify Key Uncertainties

Because of the small number of stocks, it will not be possible to get an accurate estimate of m the way it was computed for spring/summer chinook in Chapter 5 of the FY96 Retrospective Report. Rather, we will need to simplify the calculation of extra mortality, perhaps using a dependency on M, calculated from the passage model. The estimates of post-Bonneville mortality ($LAMDA_n$) and the inherent productivity (Ricker a) will be confounded, because of the small number of stocks. It is necessary, therefore, to obtain estimates of passage mortality (M) from the passage models prior to completing the MLE analyses. Participants noted that there are less differences between CRiSP and FLUSH for fall chinook than there are for spring/summer chinook. However, there are also fewer reach survival estimates with which one is able to calibrate or validate passage model estimates of survival. It was noted that since direct mortality is so high, delayed mortality may be less significant.

The group involved in passage modeling (i.e. Josh Hayes, Jim Anderson, Earl Weber, Paul Wilson, Howard Schaller) as well as the group involved in implementing harvest rules in BSM (Rick Deriso, Howard Schaller, Jim Norris) should work with others familiar with past modeling work on fall chinook (i.e. Jim Gieselman) to review what has been done before and identify the critical uncertainties that will need to be considered in the fall chinook decision analysis. They also need to work with the hydro data workgroup. This task should be completed in December, as it feeds into Task 2.2.1 on hypothesis formulation and data assumptions, which in turn feeds Tasks 2.2.2 (Model Formulation), 2.2.3 (Passage Modeling) and 2.1.6 (MLE Analysis).

2.1.5 Consideration of Past and Future Supplementation

Historically, supplementation of fall chinook has occurred both inadvertently and intentionally. For example, straying from the Umatilla hatchery has been a very important influence on Snake River fall chinook. There was some discussion on what would actually be modeled, and the conclusion was that the models would represent "naturally reproducing" fish, given that wild stocks and hatchery stocks have interbred in the past. Estimation of the amount of supplementation is important for run reconstructions; however there is considerable uncertainty regarding the spawning success of supplemented fish.

Tom Cooney and Mike Delarm (NMSF) are to work on specifying future options for supplementation of fall chinook, to be considered in the prospective modeling. This will involve a range of assumptions regarding the success of supplemented fish.

2.1.6   Agree on Standard Input Data Sets for Retrospective Passage Modeling

A fall chinook hydrosystem workgroup, co-chaired by Earl Weber and Al Giorgi, and including Ray Beamesderfer, Jim Peterson, Billy Conner (not much availability until February), someone from Battelle (possibly David Giest), Bill Muir, Mark Smith, and other members of the existing hydrosytem workgroup (*does everyone need to be a member? who specifically?*) will need to address the data assumptions to be used before retrospective passage modeling prior to the end of January.

2.1.7 Formulation of Passage Models

The passage model hypotheses need to be finalized during January, so that the retrospective passage model runs can be completed in February (Task 2.1.9), as a precursor to the MLE analysis and finalization of the BSM structure. The finalization of model structure and actual modeling will be completed by Josh Hayes, Jim Anderson, Earl Weber, Paul Wilson, and Howard Schaller. Jim and Paul will take lead responsibility for this task. Thus Task 2.1.7 feeds into Task 2.2.2.3.

2.1.10 MLE Analysis

The MLE analysis, unlike that for spring/summer chinook, is dependent on passage modeling to estimate M. The passage modeling, in turn, is dependent on the formulation of hypotheses, development of datasets in the hydrosystem workgroup for fall chinook, and model formulation activities (Tasks 2.2.1 and 2.2.2). As mentioned above, the small number of stocks will require a simplification in the calculation of extra mortality.

2.1.11 Habitat

Habitat effects on fall chinook are closely related to effects of hydro actions (mainstem spawners). The habitat workgroup should therefore work closely with the Fall chinook passage modeling workgroup (Task 2.1.7). The data for quantitatively assessing habitat effects on fall chinook is expected to be limited. Sub-Group D therefore felt that the best approach for retrospective analyses would be to review relevant published and "gray" literature and summarize evidence of habitat effects on fall chinook. There are two main areas to look at:

i) Upstream thermal conditions (e.g. Comparison of pre-smolt abundances, dam counts of out-migrants to indices of temperature for Lewis R.)

ii) Estuarine habitat (e.g. Changes in arrival time at estuary for Lewis R. stock)

The literature summary will then be used as the basis for making judgements about future habitat effects on fall chinook at the spring habitat group meeting. We should also have some preliminary modeling work by Battelle on recovery times of spawning gravel following drawdown.

2.1.12 Hatchery

Issues:

X   only one Snake R. population, one mid-Columbia population

X   heavily influenced by hatchery straying

X   large downstream and mid-Columbia releases

Data / Information To Be Collected:

X   sub-basin releases of fall chinook for years prior to around late 1970's (from Howell et al. 1985)

X   adult proportion hatchery fish (from run reconstructions)

X   whole system releases (from StreamNet / Howell et al. 1985)

X   watch for results of Comprehensive Production Review by NPPC (may be results by April)

Analytical Approach:
X   not defined at the workshop - unable to duplicate spring/summer chinook modeling approach because there is only 1 Snake R. stock, 1 mid-Columbia stock

X   suggest meeting in December to talk about possible hatchery analyses for fall chinook

2.2 Prospective Analyses

2.2.1 Hypothesis Formulation and Data Assumptions

2.2.1.1 Hydro

The end of January is the deadline for finalizing hypotheses to be used in retrospective passage modeling. As mentioned above, there are fewer data available on both reach survivals and transportation survival.

2.2.1.2 Habitat

X   analogous approach to spring/summer chinook - use data/information gathered in Task 2.1.7 as basis for making subjective judgements about effects of habitat on fall chinook

2.2.1.3 Hatchery

X   meeting in March/April to decide how to implement hatchery hypotheses for fall chinook

2.2.2 Model Formulation

There is work to be done on both the passage and prospective models. These are outlined separately below.

The BSM tasks are 2.2.2.1 through 2.2.2.4, while the passage modeling task is 2.2.3.

2.2.2.1 Meeting on Harvest Rules

Due to the much greater harvest of fall chinook, considerable attention must be paid to the harvest rate rules. A meeting will be held to specify what these are. Responsibility for this meeting is with Tom Cooney; other participants will include Peter Dygert, Mike Matylewich, Jim Norris, and Howard Schaller.

2.2.2.2 Documentation of Harvest Rules

Mary Ann Simons will document the assumptions made under Task 2.2.2.1.

2.2.2.3 Meeting on the Structure of the Fall Chinook BSM

The meeting will be held in mid-March to finalize the structure of the BSM model for fall chinook. This will need to incorporate hypotheses related to both harvest and hatchery decisions, and the response of fish to those decisions. This meeting also can not occur until after the passage modeling has been completed for the retrospective analysis. People attending this meeting will include: Rick Deriso, Howard Schaller, Jim Norris, Charlie Paulsen and others.

2.2.2.4 Development of F-BSM
This is to be carried out by Rick Deriso, with assistance from Howard Schaller and Jim Norris.

2.2.4 Prospective Modeling

This modeling needs to commence in May, following completion of the MLE analysis (Task 2.1.10), and completion of the passage modeling (Task 2.2.3). We note that considerable thought will need to be given to the specific hypotheses incorporated into both the passage and BSM models, notwithstanding the tight time constraints to get this modeling underway. There is a risk that within that tight time schedule people may be inclined to utilize the models in their former incarnations, even though further understanding has been gained from the retrospective analyses.

2.2.5 Post Processing and Sensitivity Analyses

These will be begun in May, as the prospective runs are completed; the same process as described above for spring/summer chinook will be used.

2.2.6 Preliminary Decision Analysis Report

This report will be commenced in June and completed by the end of that month.

3. Steelhead

3.1 Retrospective Analyses

Since Spawner:Recruit data for steelhead is limited (see Charlie Petrosky's "Steelhead Data Reconnaissance and Run Reconstruction Report"distributed at the workshop for description of data/stocks available), the initial priority for steelhead data will be on compiling Smolt-to-Adult Return (SAR) data. There are several advantages to looking at SAR data first:

- X   easier/quicker to compile

- X   avoids scheduling conflicts - same people are involved in Steelhead and Fall chinook run reconstruction

- X   SAR analyses will help to define possibilities for completing run reconstructions

3.1.1 Smolt to Adult Return (SAR) Analyses

- X   Snake R. aggregate - almost completed; some years of age structure data available

- X   Mid-Columbia - mid-Columbia workgroup to complete by January

3.1.2 Run Reconstructions

Run reconstructions will be needed if we use same approach to prospective analyses as the current approach for spring/summer chinook. However, we note that there will likely not be enough data for the same length and breadth of reconstructions as were possible for spring/summer chinook. Also, Steelhead run reconstructions are based on dam counts, not redd counts.

The steelhead workgroup (Petrosky, Langness, Krasnow, etc.) will meet in January to work out relative priorities for:

X   reconstructions for aggregate Snake R., mid-Columbia stocks vs. individual stocks

X   which individual stocks - (e.g. reconstructions assuming fixed life cycle completed for Clearwater stock, some post-1970 data available for Running River stock)

Charlie Petrosky noted that there was a good fit between SARs and m-∗ for spring/summer chinook - this may be a possible way to link steelhead SARs to run reconstructions if data to actually do the run reconstructions are not available.

3.1.6 Habitat

The types of analyses used for spring-summer chinook may be possible for steelhead. Examples are analyses of parr density and PIT-tag data. Availability of data to do these analyses needs to be checked by the end of December (parr-density - Charlie Petrosky; PIT-tag - Charlie Paulsen).

3.1.7 Hatchery

The approach to hatchery analyses will depend on what sort of data and run reconstructions are available. The following possibilities were discussed at the workshop:

3.1.7.1 PIT-tag Analyses

X   assess data simultaneously with spring/summer chinook (Task 1.1.6.3); do analyses later (Feb)

3.1.7.2 Section 11.2 Additional Analyses (Comparison of wild and hatchery recruits/spawner)

X   possibly do for Little Sheep / Imnaha; assess feasibility by Dec. 15

3.1.7.3 Spring/summer - Type Analysis on Run Reconstructions

X   dependent on run reconstructions (see Task 3.1.2)

3.1.7.4 Extract Hatchery Release Data and Manipulate for Analysis

X   do when run reconstructions nearing completion

3.2 Prospective/Decision Analysis

3.2.1 Hypothesis Formulation

3.2.1.2 Habitat

The habitat workgroup will use an expert judgement approach for assessing possible habitat effects or steelhead. Where steelhead occupy same sub-basins as spring/summer chinooks, the simplest possible approach to determining the implications of future habitat management for steelhead is to use the judgements already done for spring/summer chinook. However, the group noted several possible differences between steelhead and spring/summer chinook:

> X steelhead live in higher gradient streams

> X steelhead have longer freshwater residence times

> X some sub-basins occupied by steelhead are not occupied by spring/summer chinook

In other cases, the group will have to rely on other analyses and information (e.g. PIT-tag, parr density data). This information should be compiled by the end of March, followed by a meeting in April to assign probabilities to changes in Ricker 'a'.

3.2.1.3

Retrospective hatchery analyses for steel head should be completed by March. Once this information is compiled, the prospective modeling group will decide how to implement hatcheries in the prospective analyses.

3.2.1.4 Harvest

The main harvest issue for steelhead is in-river harvest. Steelhead have a longer exposure to freshwater sport fishery than other species, and there is minimal ocean harvest (very few ocean CWT recoveries). The steelhead workgroup will coordinate with TAC to get harvest estimates for Steelhead, broken down by A and B runs. Mainstem harvest rates are needed for upstream conversion rates. Harvest analyses should be completed by the end of February.

Tom Cooney and other agency policy people will develop alternative harvest scenarios. A potential complication is incidental mortality of steelhead in mainstem commercial fisheries for other species.

Other Steelhead Tasks

The scope and depth of other retrospective and prospective / decision analysis tasks for Steelhead will depend on what sort of SAR or run reconstruction data are available. Since these data will not be available until January (SARs) or March (Run Reconstruction), we have not developed a detailed schedule for remaining Steelhead tasks. The steelhead schedule will be developed as it becomes clearer what analyses are possible.